

2011 BWSR Academy

CONSTRUCTION MANAGEMENT AND INSPECTION



Programs/Funding Sources /Conservation Practices

EWP

RIM

FDR

CRP

CREP

WRP

WLI

EQIP

LCCMR

OHF

Wetland
Banking

CWF



Wetland Restoration





Agenda

- Construction Plan/Documents
- Contractor Bidding and Selection
- Construction Implementation
- Project Close-Out

Agenda

- **Construction Plan/Documents**
- Contractor Bidding and Selection
- Construction Implementation
- Project Close-Out



Agenda

■ Construction Plan/Documents

- ❖ Plan
- ❖ Specifications
- ❖ Measurement and Payment
- ❖ Inspection Plan
- ❖ Bid Process
- ❖ Contracts



Construction Plan/Documents

■ Plan

- ❖ Cover Sheet
- ❖ Layout Sheet
- ❖ Plan View Sheet
- ❖ Detail Sheets

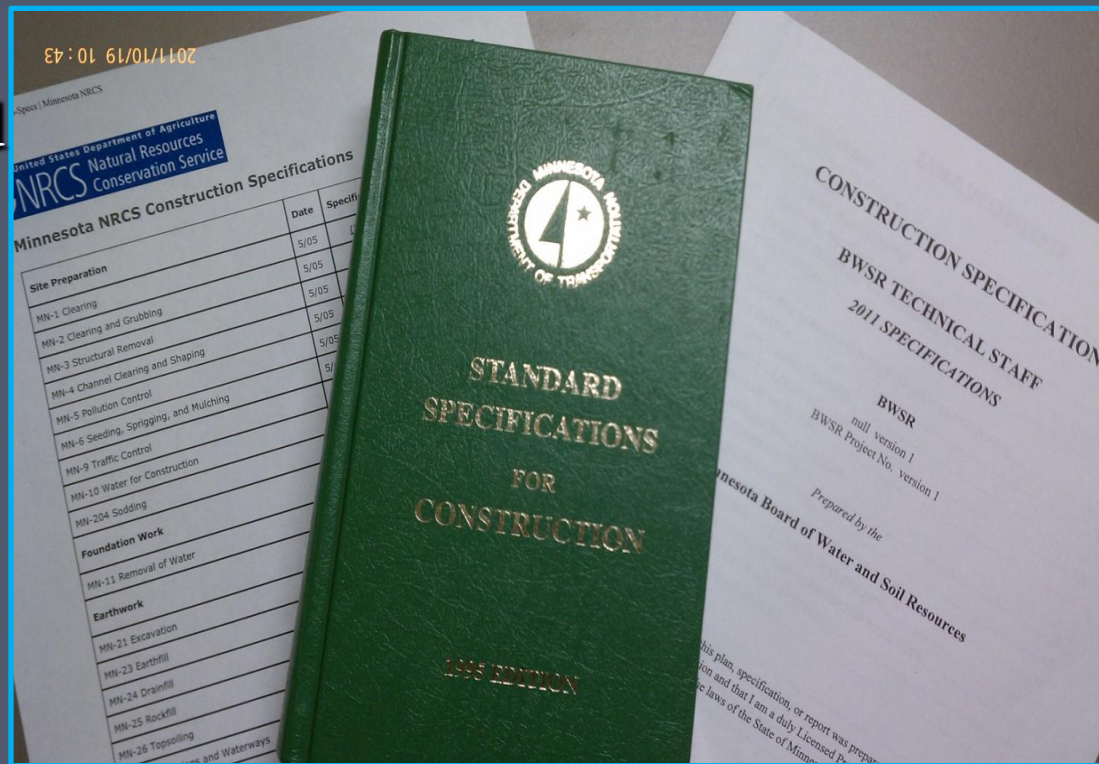




Construction Plan/Documents

■ Specifications

- ❖ NRCS/SWCD
- ❖ BWSR
- ❖ Ducks Unlimited
- ❖ MnDOT
- ❖ Others



Specifications

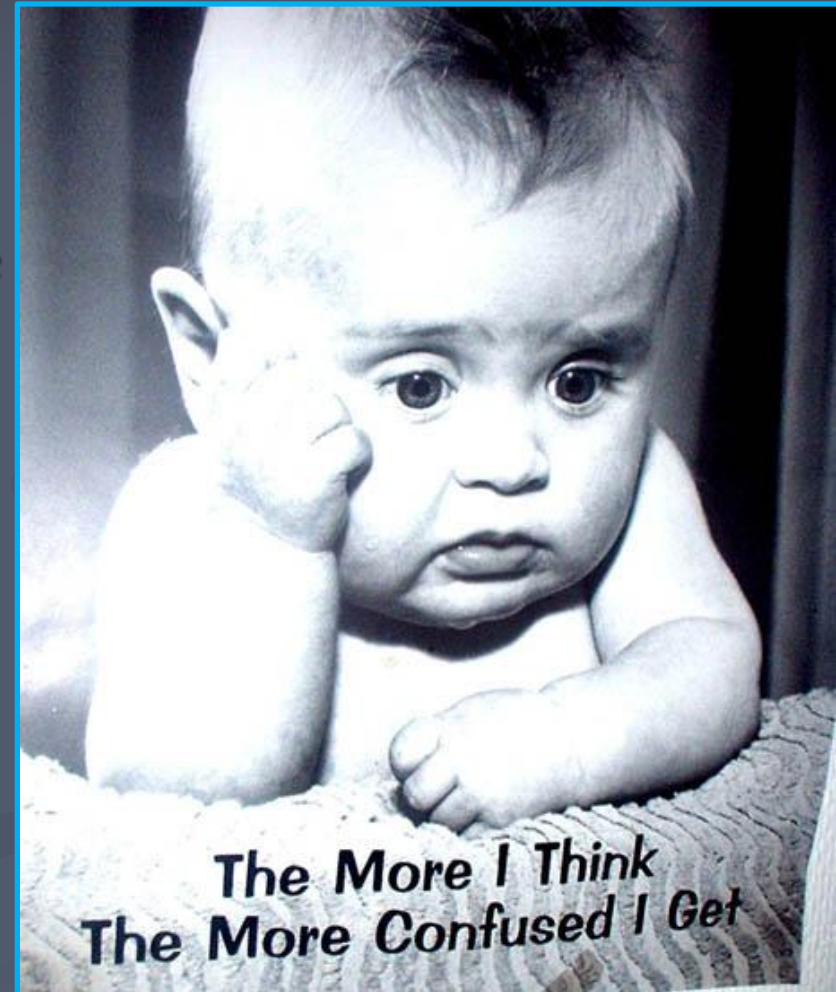
■ Reference Specifications

- ❖ Referred to by Construction and/or Material Specifications
- ❖ “Industry” Established
- ❖ List (Not Necessarily Complete)
 - ASTM – American Society for Testing and Materials
 - ACI – American Concrete Institute
 - AASHTO – American Association of State Highway and Transportation Officials

Construction Plan/Documents

■ Measurement and Payment

- ❖ Lump Sum
- ❖ Time and Materials
- ❖ Bid Quantities/Unit Price





Construction Plan/Documents

■ Measurement and Payment

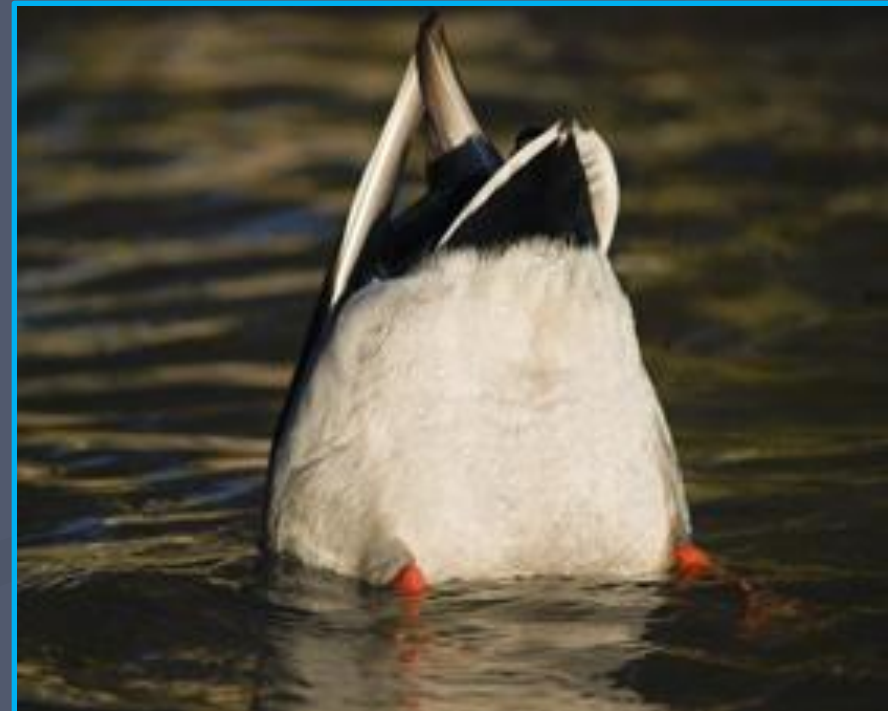
❖ Which Method to Use?

- Size of the Job
- Complexity
- Which Program is Cost-Sharing the Project

Construction Plan/Documents

■ Measurement and Payment

- ❖ Lump Sum
- ❖ Time and Materials
- ❖ Bid Quantities/Unit Price



Measurement and Payment

■ Lump Sum

❖ Pros:

- Easy to Manage
- Good for Small Projects with Very Few Items
- Limited Inspection and Record Keeping
- No Measurements



Measurement and Payment

■ Lump Sum

❖ Cons:

- Higher Built in Costs
- Disputes Difficult to Resolve (usually)
- Modifications Difficult



Construction Plan/Documents

■ Measurement and Payment

- ❖ Lump Sum
- ❖ Time and Materials
- ❖ Bid Quantities/Unit Price





Measurement and Payment

■ Time & Materials

❖ Pros:

- Good for Contractor
- Limited Measurements
- Moderate Record Keeping
- Modifications Easier



Measurement and Payment

■ Time & Materials

❖ Cons:

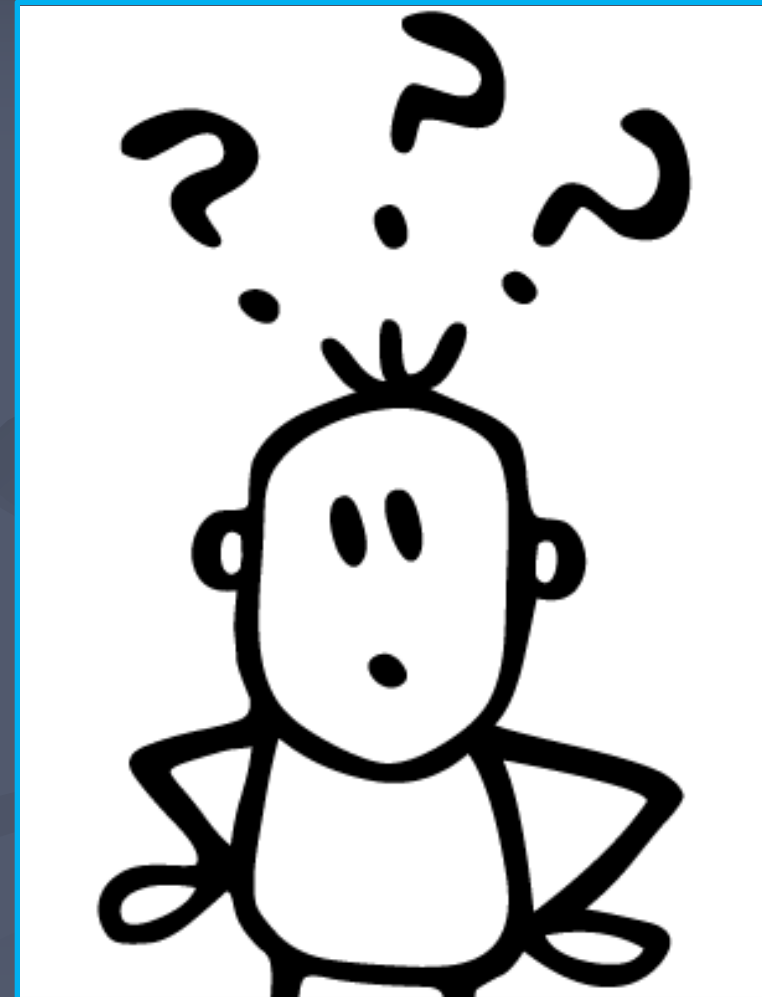
- Contractor Inefficiencies
- Cost “Overruns” Hard to Account for
- Higher Inspection Needs



Construction Plan/Documents

■ Measurement and Payment

- ❖ Lump Sum
- ❖ Time and Materials
- ❖ Bid Quantities/Unit Price



Construction Plan/Documents

■ Unit Price (Bid Form)

BID FORM					
Project Name: <i>Ed Jones RIM-WRP Wetland Restoration</i>			Project No: <i>2008-007</i> <i>30-Sep-2009</i>		
CONTRACTOR INFORMATION					
Contractor/Company Name: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		Business Phone No.: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		Cell Phone No.: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	
Address: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		City/State/Zip Code: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		Contractor Signature: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	
Item / Spec. No.	Description of Bid Item	Pay Unit	Estimated Quantity	Unit Price	Sub Total Cost
1	Mobilization (not to exceed 5% of total bid price)	L.S.	1.0		
2	Salvage & Spread Topsoil <i>(approx. 1,000 C.Y. of embankment subcut)</i>	C.Y.	1.0		
2.210					
3	Excavation - Spillway (P)	C.Y.	1.0		
2.220					
4	Excavation - Shallow Scrape - Wetland Basin #2	C.Y.	1.0		
2.220					
5	Earthfill - Core Trench (CV)	C.Y.	1.0		
2.230					
6	Earthfill - Core Trench (CV)	C.Y.	1.0		
2.230					
7	Earthfill - Embankment (P) (CV) <i>(Includes volumes for subcut area and settlement allowance)</i>	C.Y.	1.0		
2.230					
8	Earthfill - Loose Volume Fill (P)	C.Y.	1.0		
2.240					
9	Tile Investigation	L.F.	1.0		
2.391					
10	Tile Block/Removal	L.F.	1.0		
2.391					
11	F&I 6" CPE Non-Perforated Corrugated Drainage Tile for Tile Outlet	L.F.	1.0		
2.330					

Measurement and Payment

■ Bid Quantities/Unit Price

❖ Pros:

- Fairest to Owner & Contractor
- Modifications Easy
- Disputes Easier to Resolve (usually)



Measurement and Payment

■ Bid Quantities/Unit Price

❖ Cons:

- Time Consuming
- Extensive Inspection and Record Keeping
- Risk “unbalanced bidding”





Inspection Plan

- Identifies Work to be Accomplished
- Identifies Items to be Inspected
- Identifies Degree of Inspection Required





Inspection Plan

Inspection Plan

8/31/11

David & Rae Cech
RIM-WRP Wetland Restoration
Freeborn County, MN
Section 26 Moscow Township

A. General

The work to be accomplished on this project consists of:

1. Common excavation and earthfill
2. Tile investigation and tile removal
3. Installation of tile and associated components
4. Installation of a HDPE culvert for water control and associated components
5. Installation of a vinyl sheet pile water control structure and associated components
6. Placement of rock riprap and geotextile
7. Shallow wetland scrape
8. Seeding and mulching

This project is an Engineering Job Class III. A pre-construction meeting should be scheduled with the Contractor, Engineer and Project Technician(s) all present.

B. Items of Work to be Inspected

Construction layout and checking shall follow Minnesota Engineering Procedure #4-V as stated in the Engineering Field Handbook, pages 5-66 through 5-68.

Common Excavation and Earthfill

Periodic inspection will be required for salvaging and spreading topsoil to ensure entire area under the planned fill for area of structure for basin #1. Periodic inspection will be required for the planned earthfills to ensure suitable borrow material is used following requirements shown on the plans. Compaction of the earthfill shall be as specified with no testing required.

Tile Investigation and Tile Removal

Periodic inspection will be required to ensure all tile is located and removed as planned. Any tile investigation trenches shall be not be within 25-feet of planned embankments unless other wise approved. The BWSR Project Engineer or representative thereof shall be present during this investigation.

Tile Installation and Outlets

Continuous inspection will be required for all tile installations. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Bedding and compaction of material around tile needs to be closely monitored and shall follow specifications.

Culverts

Continuous inspection will be required for the installation of the culvert and metal end sections where called for. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Compaction of material around pipe needs to be closely monitored and shall follow specifications. Coordination with township prior to installing culvert under road will be necessary.

Vinyl Sheet Pile

Continuous inspection will be required for the installation of the vinyl sheet pile structure. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Installation of the vinyl sheeting and compaction of required backfill against the sheeting needs to be closely monitored and shall follow specifications. The BWSR Project Engineer or representative thereof shall be present during the installation of the vinyl piling.

Rock Riprap and Geotextile

Periodic inspection will be required for the installation of the Geotextile and rock riprap materials where called for. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Materials shall be placed as specified and shall be to the lines and grades shown.

Shallow Wetland Scrape

Periodic inspection will be required to ensure the proper amount of material is removed as planned and as staked. A final survey of the excavated area will be required to determine actual quantities excavated and the pay amount will need to be adjusted accordingly.

Seeding and Mulching

Periodic inspection will be required. Seed mix shall be verified as meeting specifications. Mulch shall be inspected and verified as being weed free and shall be installed as specified.

C. Personnel Recommendations

The BWSR Project Engineer or an authorized representative shall be responsible for layout, construction inspection, check out and certification of the project upon completion.

Prepared by:

Terry Ragan, P.E.
BWSR Project Engineer

Date



Bid Process

- Simple – (no contract)
 - ❖ Small amounts
 - ❖ Private land (landowner hires)
- Complex - (contract)
 - ❖ Public lands
 - ❖ Large projects



Simple Bidding (No Contract)

- Plan Sheets
- Specifications
- Bid Form



Complex Bidding (Contract)

■ Formal Contract

- ❖ Plan Sheets
- ❖ Specifications
- ❖ Bid Form
- ❖ Other Documents (as per Agency)



Agenda

- Construction Plan Components
- **Contractor Bidding and Selection**
- Construction Implementation
- Project Close-Out



Agenda

■ Contractor Bidding and Selection

- ❖ Pre-Bid Meeting
- ❖ Bidding Process
- ❖ Contractor Selection





Pre-Bid Meeting?

- Type of Project
- Complexity of the Project
- Specialty Materials Used
- Typically Not Needed





Bidding Process



Instructions for Soliciting Bids for BWSR Designed/Coordinated Wetland Restorations on BWSR Conservation Easements

1. Field office (SWCD, NRCS, or other program partner) should provide cooperator (landowner) with copies of all construction documents. All of the documents together make up the construction plan. Review these documents and the bidding process outlined herein with the cooperator. When multiple landowners are involved (group projects) a primary cooperator should be identified as a main contact for bidders. PDF copies of the construction plans are available upon request.
2. Cooperator signature should be obtained on construction plans when required. Cooperator signed plans should be kept on file in field office.
3. Cooperator is responsible for hiring a contractor. Field office should provide cooperator with a list of suggested contractors for bid consideration.
4. In an attempt to receive at least 3 bids on the project, the cooperator should be instructed to solicit bids from at least 5 contractors. Cooperator can either send out solicitations for bids themselves or have the field office coordinate the process.
5. The engineer's cost estimate that is provided is for field office use only. It should not be made available to prospective bidders and only provided to cooperators under special circumstances.
6. For large and/or complex projects, a pre-bid meeting may be desired or deemed necessary. The field office should assist the cooperator in scheduling a meeting with the selected contractors and an appropriate BWSR engineering representative.
7. Bid due dates should be established and made known to all prospective bidders. **15 to 30 days** is an appropriate timeframe. When appropriate, construction completion dates should also be identified and made known to prospective contractors who will be bidding on the project.
8. The field office should provide oversight to the bidding process, review the bids, and confirm the cooperator's selection of a contractor. Although not required, a minimum of 3 bids should be received by the cooperator and submitted to the field office for review.
9. It is preferred to have the cooperator consider hiring the contractor with the lowest bid assuming the bid is deemed accurate and does not exceed 10% of the engineer's estimate*. However, any bid that does not exceed 10% of the engineer's estimate can be considered.
10. The cooperator shall be responsible to notify the bidding contractors of their hiring decision. The contractor should be reminded of the construction due date, if established.
11. The cooperator shall also have the decision of whether or not to share the awarded bid information with unsuccessful bidders.

* If the returned bids exceed the engineer's estimate by more than 10%, the field office should contact the project engineer or other BWSR representative. To remain eligible for maximum practice reimbursement benefits, the cooperator will be instructed to either solicit additional bids or negotiate with current bidders in an attempt to correct unbalanced or unreasonable bid items. In some situations, it may not be feasible to negotiate or consider a new bid solicitation and exceptions may be allowed. In other cases, the cooperator may be asked to cover any unfunded balance should they desire to proceed with hiring a contractor whose bid exceeds the 10% limit.



Contractor Selection

- Approved Contractor List
- Landowner Preference
- Past Contractors
- Formal Advertising
- Availability & Experience

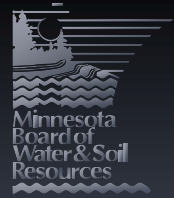




Agenda

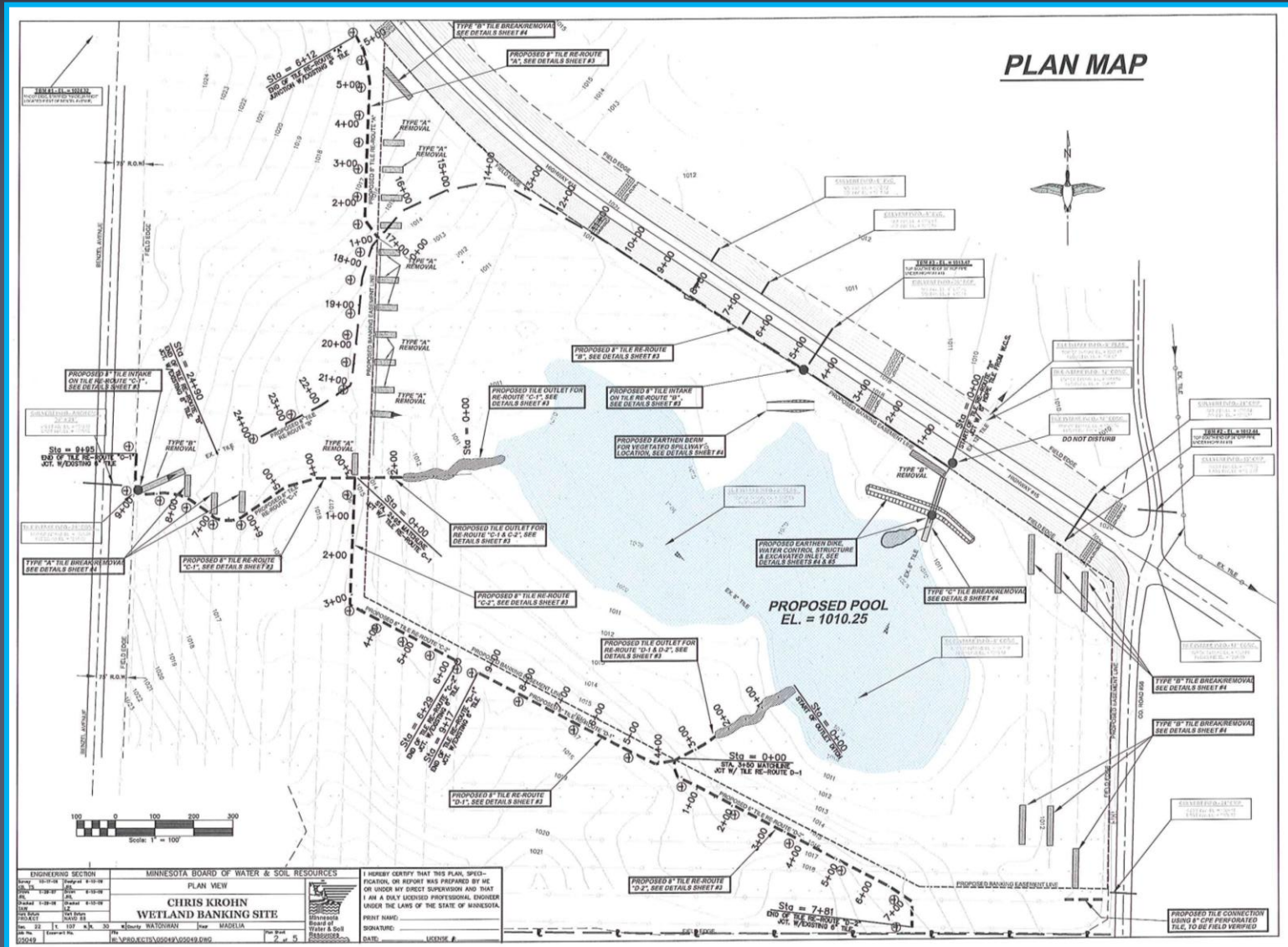
- Construction Plan Components
- Contractor Bidding and Selection
- **Construction Implementation**
- Project Close-Out



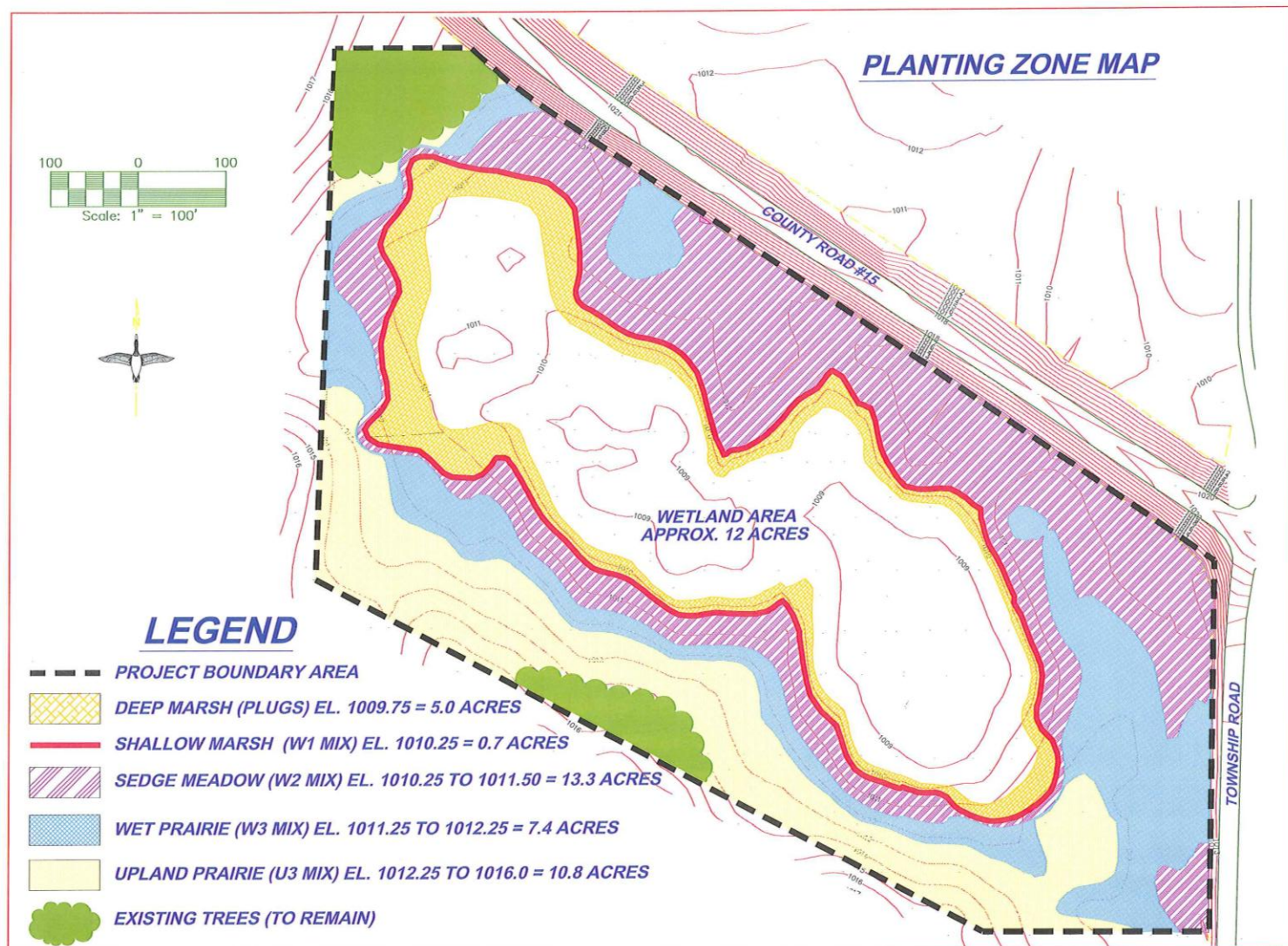


Existing Site Conditions





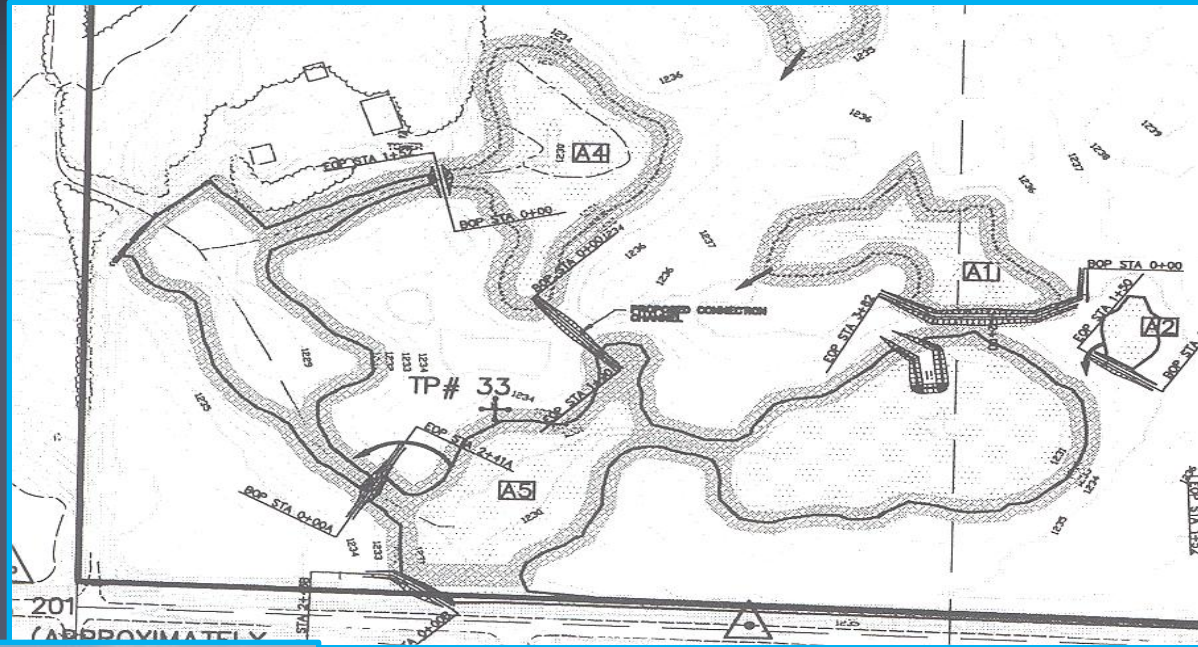
Seeding Plan/Map

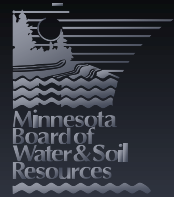


Completed Restoration



A colorful illustration featuring a clock, an open book, and a notepad. The clock is on the left, showing a time around 10:10. The open book is in the center, with its pages blank. The notepad is on the right, with several horizontal lines. Numbers are scattered around the objects: 7, 2, 3, 1, 5, 3, 2, 1, 5, 1, 3.

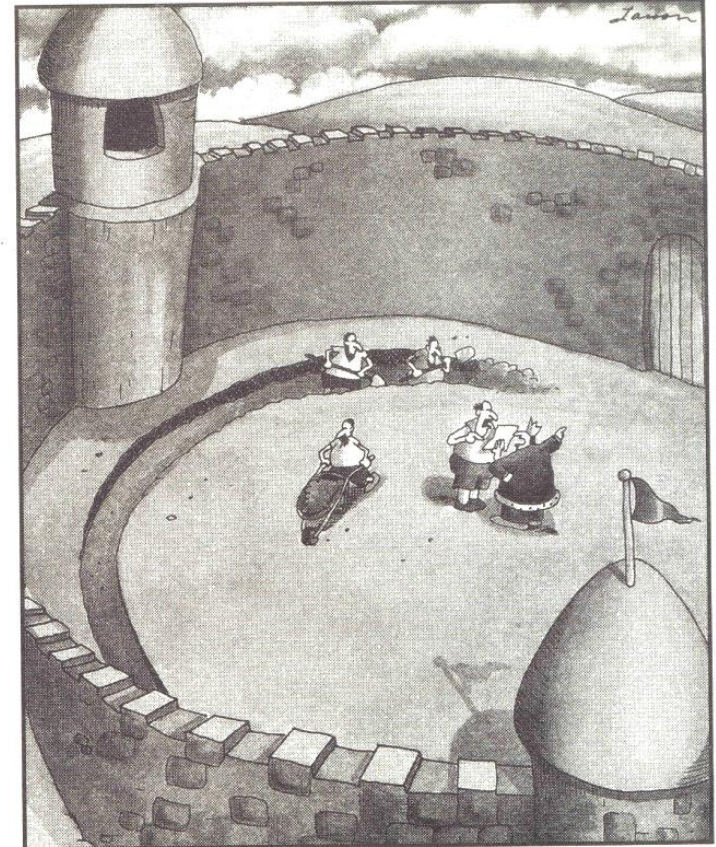




Agenda

■ Construction Implementation

- ❖ Engineering/Technical Practices
- ❖ Vegetation Establishment



Suddenly, a heated exchange took place between the king and the moat contractor.



Agenda

■ Engineering/Technical Practices

- ❖ Pre-Construction Meeting
- ❖ Permits
- ❖ Layout & Staking
- ❖ Construction Observation
- ❖ Project Modifications





Engineering/Technical Practices

■ Pre-Construction Meeting

- ❖ What Projects Require Meeting
- ❖ Who Should Attend
- ❖ What Should be Covered
- ❖ When to Hold Meeting
- ❖ Who is Responsible for What



Pre-Construction Meeting

■ What Projects Require Meeting

❖ Most Every Project. Depends on:

- Complexity of the Work
- Knowledge and Experience of the Principals



Pre-Construction Meeting

■ Who Should Attend

- ❖ Owner
- ❖ Contractor
- ❖ Engineer (or Representative)
- ❖ Construction Inspector
- ❖ Others



Pre-Construction Meeting

■ What Should be Covered

Pre-Construction Meeting

2011 BWSR Academy RIM-WRP
Wetland Restoration Project
Crow Wing County, Minnesota
Project No. 2011-001
Location: Breezy Point Convention Center

October 26th, 2011

1. Introductions

List of Representatives

Contractor: Name:
Address:
Phone:

**Project Foreman/
Superintendent:** Name:
Phone #(s):

Project Engineer: Name:
Address:
Phone:

**Project Technicians/
Inspectors:** Name:
Phone:

Name:
Phone:

Name:
Phone:

2. Status of Notice of Award and Notice to Proceed

3.

4. Need for Additional Plans, Addendums and Specifications

5. Construction Schedule

- Start Date:
- Completion Date:

6. Unit Price Contract

7. Payment

- Partial Payments:
- Final Payment:



8. Utility Impacts/Notifications

- Gopher-State-One-Call Status:
 - Ticket Number:

9. Permits

- NPDES
- Public Waters
- R-O-W
- Utility

10. Staging/Storage Areas –

11. Temporary Facilities –

12. Site Access

- Working Limits
- Archeological Remains

13. Plan Review/Construction Sequence –

14. Construction Methods/Specifications

- Borrow Material/Embankment/Road Slope Improvements
- Compaction Requirements
- Settlement
- Outlet Structures
- Manufactured Products/Materials
- Erosion Control/Site Stabilization

15. Coordination of Work by Others

16. Traffic Control

17. Submittals

- Estimated progress schedule and partial payment breakdown
- List of subcontractors and suppliers

18. Staking/Construction Layout – To be completed by SWCD & BWSR. Provide 48 hours notice.

19. Construction Observations/Inspections

- BWSR and SWCD staff will provide construction observation for the project

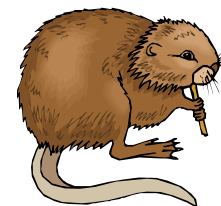
20. Inspections and Testing

- Inspections by Engineer or authorized representative Prior to any concealment
- During construction
- Inspections by others

21. Site Cleanup/Closeout

22. Final Comments/Questions

•
•





Pre-Construction Meeting

■ When to Hold Meeting

- ❖ Before Construction Starts
- ❖ Day Construction Starts





Pre-Construction Meeting

■ Who is Responsible for What

- ❖ Owner
- ❖ Contractor
- ❖ Engineer/Inspector
- ❖ Others



Engineering/Technical Practices

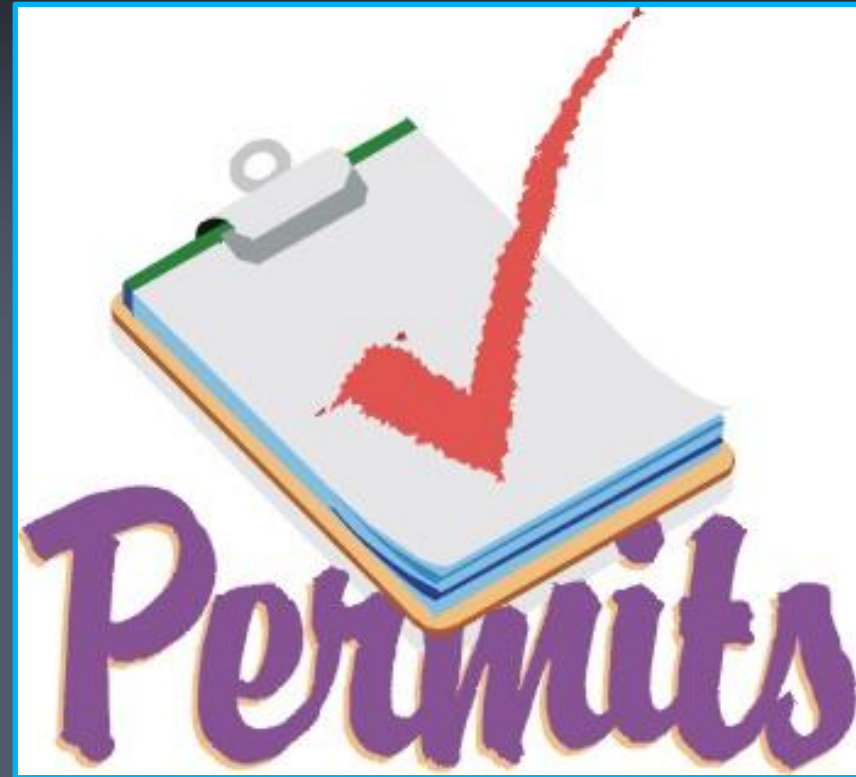
■ Permits

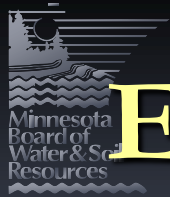
❖ Landowner

- NPDES Permit
- Local Permits/Approvals

❖ Contractor

- NPDES Permit
- Gopher State One-Call
- Road Authority Approval/Permit

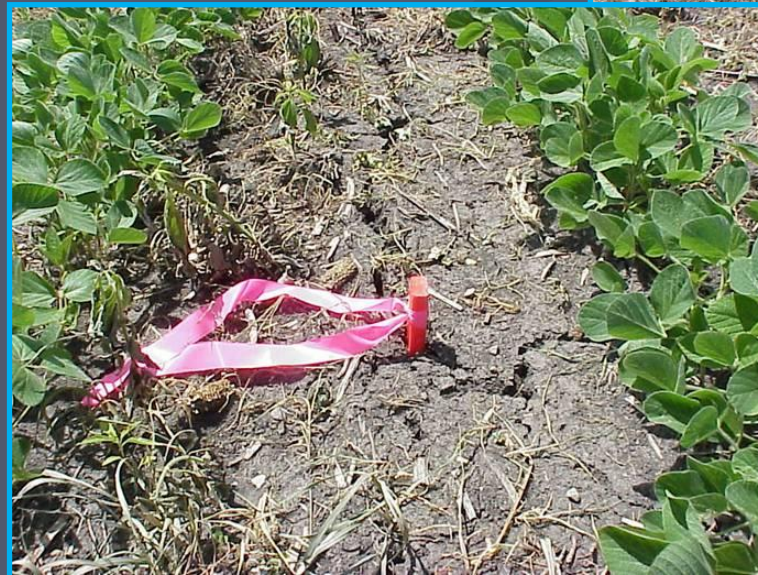




Engineering/Technical Practices

■ Layout & Staking

- ❖ How Much is Enough?
- ❖ Bench Marks
- ❖ What does the Contractor Want?
- ❖ Keep the Contractor Informed.





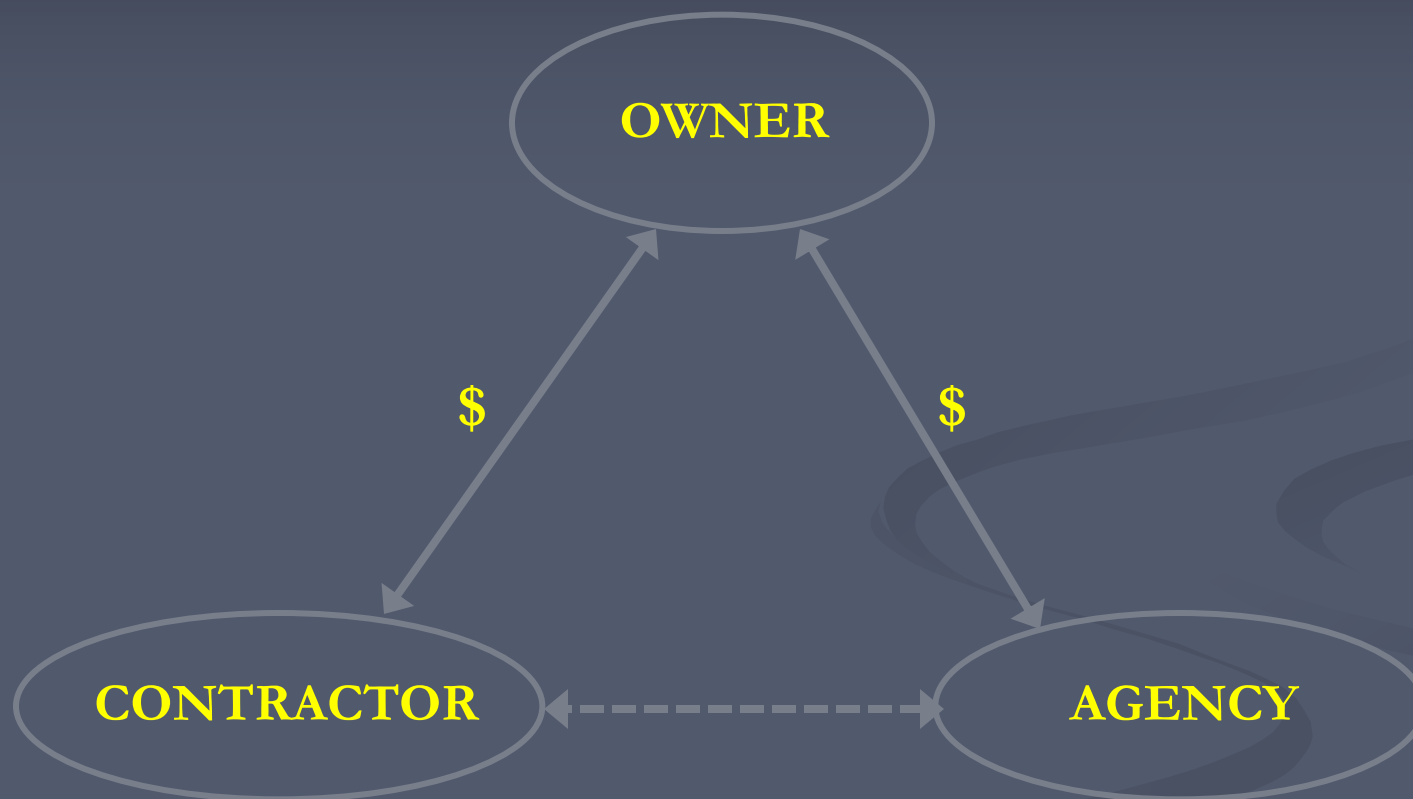
Engineering/Technical Practices

■ Construction Observation

- ❖ Sequencing
- ❖ BMP's
- ❖ Quality Control
- ❖ TAA
- ❖ Documentation
 - Quantities
 - Processes used
 - Photos
 - Material verification
 - Daily Diary/Log



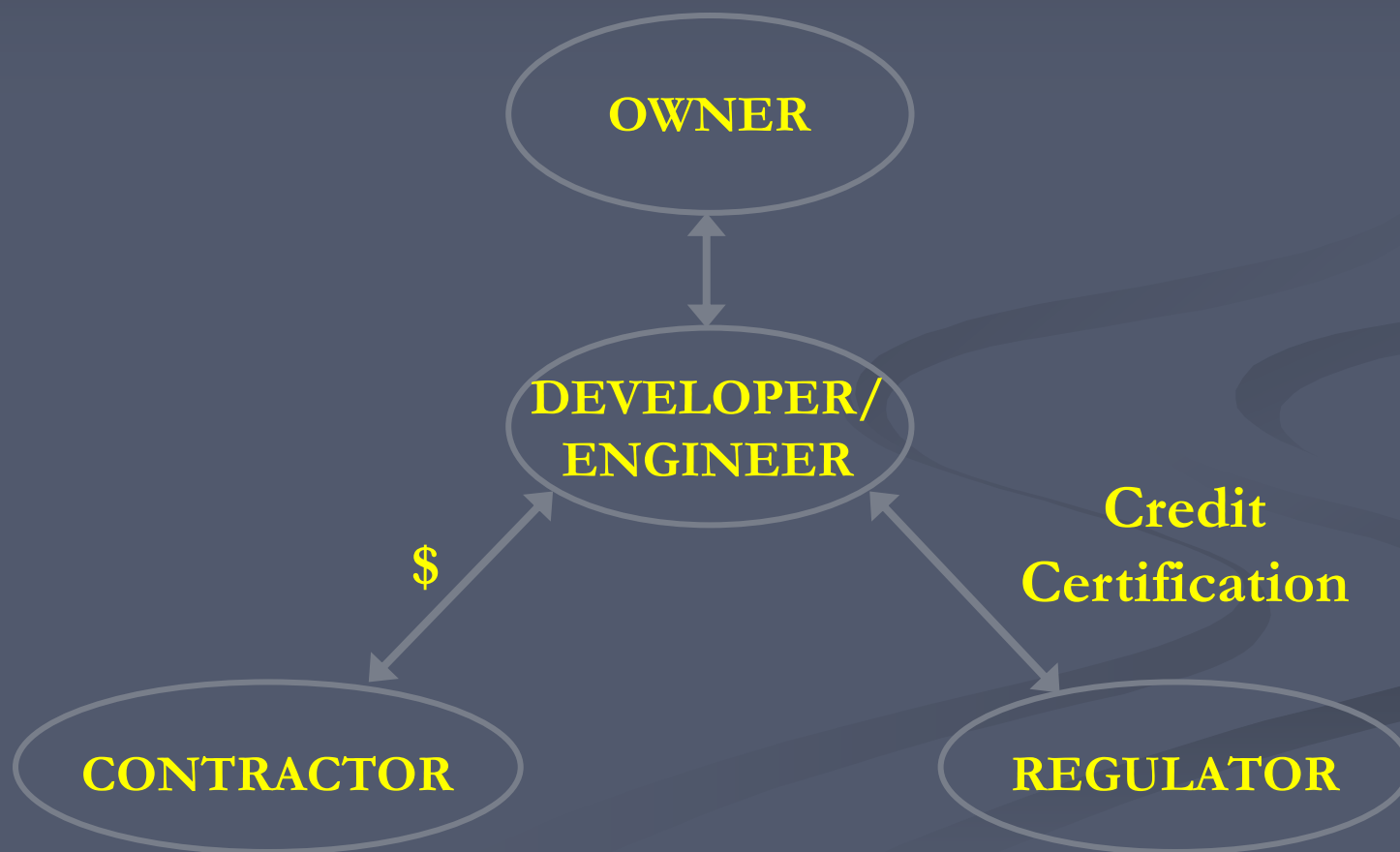
“Conservation Projects” Model





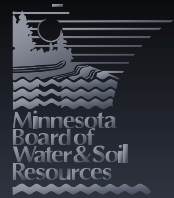
Typical “Wetland Mitigation” Model

Private Wetland Banks & Replacement Sites



Construction Observation

Construction Inspection is OBSERVING construction methods and procedures, examining and testing materials used and examining and testing the resulting finished work.



Construction Observation

The construction inspector's prime responsibility is that of OBSERVING construction.....



Construction Observation

The project specifications are the main criteria governing the decisions and actions of an inspector; therefore, clear specifications and drawings are important.



Sequencing

■ Construction Activities Sequencing

- ❖ Efficiency
- ❖ Reduce Erosion
- ❖ Aides in Scheduling
- ❖ Smoother Flow of Activities
- ❖ First Things First
- ❖ Frequency/Number of Trips

Construction Practices Sequencing



Description

A work schedule that coordinates the sequence of land-disturbing activities with the installation of erosion and sedimentation control practices.

A construction sequence schedule is a specified work schedule that coordinates the timing of land-disturbing activities and the installation of erosion-protection and sedimentation-control measures.

Purpose

To reduce on-site erosion and off-site sedimentation from land-disturbing activities by installing erosion and sedimentation control practices in accordance with a planned schedule.

Reduce on-site erosion and off-site sedimentation by performing land-disturbing activities and installing erosion-protection and sedimentation-control practices in accordance with a planned schedule.

Preserving the natural vegetation on-site to the maximum extent practicable will minimize the impacts of development on stormwater runoff. Preferably 65 percent or more of the development site should be protected for the purposes of retaining or enhancing existing forest cover and preserving wetlands and stream corridors.

Effectiveness

All land development that clears, grades or fills a significant land area. The removal of existing surface ground cover leaves a site vulnerable to accelerated erosion.

Good planning will:

- Reduce land clearing
- Provide necessary controls
- Restore protective cover.

New development often takes place on tracts of forested land. In fact, building sites are often selected because of the presence of mature trees. However, unless sufficient care is taken and planning done, in

Purpose

Water Quantity

Flow attenuation ☐

Runoff volume reduction ☐

Water Quality

Pollution prevention

Soil erosion ☒

Sediment control ☒

Nutrient loading ☒

Pollutant removal

Total suspended sediment (TSS) ☒

Total phosphorus (P) ☒

Nitrogen (N) ☒

Heavy metals ☒

Floatables ☐

Oil and grease ☐

Other ☐

Fecal coliform ☐

Biochemical oxygen demand (BOD) ☐

☒ Primary design benefit

☒ Secondary design benefit

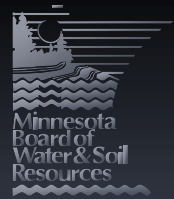
☐ Little or no design benefit



Engineering/Technical Practices

■ BMP'S

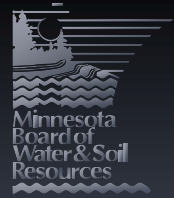
- ❖ Construction Activities Sequencing
- ❖ Silt Fence
- ❖ Erosion Control Fabric/Mats
- ❖ Bio Rolls
- ❖ Mulching
- ❖ Temporary & Permanent Seeding
- ❖ Others



BMP's

■ Silt Fence

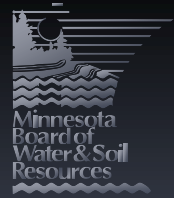




BMP's

■ Erosion Control Fabric/Mats

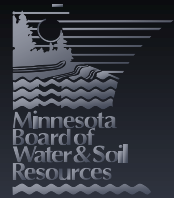




BMP's

■ Bio Rolls





BMP's

■ Mulching





BMP's

■ Temporary & Permanent Seeding

Permanent Seeding



Temporary Seeding





Quality Control

Inspection Plan 8/31/11

David & Rae Cech
RIM-WRP Wetland Restoration
Freeborn County, MN
Section 26 Moscow Township

A. General

The work to be accomplished on this project consists of:

1. Common excavation and earthfill
2. Tile investigation and tile removal
3. Installation of tile and associated components
4. Installation of a HDPE culvert for water control and associated components
5. Installation of a vinyl sheet pile water control structure and associated components
6. Placement of rock riprap and geotextile
7. Shallow wetland scrape
8. Seeding and mulching

This project is an Engineering Job Class III. A pre-construction meeting should be scheduled with the Contractor, Engineer and Project Technician(s) all present.

B. Items of Work to be Inspected

Construction layout and checking shall follow Minnesota Engineering Procedure #4-V as stated in the Engineering Field Handbook, pages 5-66 through 5-68.

Common Excavation and Earthfill

Periodic inspection will be required for salvaging and spreading topsoil to ensure entire area under the planned fill for area of structure for basin #1. Periodic inspection will be required for the planned earthfills to ensure suitable borrow material is used following requirements shown on the plans. Compaction of the earthfill shall be as specified with no testing required.

Tile Investigation and Tile Removal

Periodic inspection will be required to ensure all tile is located and removed as planned. Any tile investigation trenches shall be not be within 25-feet of planned embankments unless other wise approved. The BWSR Project Engineer or representative thereof shall be present during this investigation.

Tile Installation and Outlets

Continuous inspection will be required for all tile installations. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Bedding and compaction of material around tile needs to be closely monitored and shall follow specifications.

Culverts

Continuous inspection will be required for the installation of the culvert and metal end sections where called for. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Compaction of material around pipe needs to be closely monitored and shall follow specifications. Coordination with township prior to installing culvert under road will be necessary.

Vinyl Sheet Pile

Continuous inspection will be required for the installation of the vinyl sheet pile structure. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Installation of the vinyl sheeting and compaction of required backfill against the sheeting needs to be closely monitored and shall follow specifications. The BWSR Project Engineer or representative thereof shall be present during the installation of the vinyl piling.

Rock Riprap and Geotextile

Periodic inspection will be required for the installation of the Geotextile and rock riprap materials where called for. Materials delivered to the site need to be inspected and evaluated prior to placement to ensure conformance to specifications. Materials shall be placed as specified and shall be to the lines and grades shown.

Shallow Wetland Scrape

Periodic inspection will be required to ensure the proper amount of material is removed as planned and as staked. A final survey of the excavated area will be required to determine actual quantities excavated and the pay amount will need to be adjusted accordingly.

Seeding and Mulching

Periodic inspection will be required. Seed mix shall be verified as meeting specifications. Mulch shall be inspected and verified as being weed free and shall be installed as specified.

C. Personnel Recommendations

The BWSR Project Engineer or an authorized representative shall be responsible for layout, construction inspection, check out and certification of the project upon completion.

Prepared by:

Terry Ragan, P.E.
BWSR Project Engineer

Date



Construction Observation

■ Technical Approval Authority (TAA)

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MN-MGT-008
1/97

CONSERVATION PRACTICE
TECHNICAL APPROVAL AUTHORITY

Assignment and Acceptance
For

(Employee) _____
(Title)

(Employer) SWCD Part A DATE _____
Part B DATE _____

ETHICS STATEMENT

By signing this form, I agree to utilize my assigned technical approval authority only for work that I am competent and qualified to perform. I will seek assistance from others when complicating factors warrant.

I also understand that conservation practices can have negative effects on some resources. I agree to consider the impacts of practices on all resources before recommending their use.

(Employee's Signature)

Technical Approval Authority assigned by:

(Name) _____
(Title)

(Signature) _____
(Date)

ETHICS STATEMENT

By signing this form, I agree to utilize my assigned technical approval authority only for work that I am competent and qualified to perform. I will seek assistance from others when complicating factors warrant.

I also understand that conservation practices can have negative effects on some resources. I agree to consider the impacts of practices on all resources before recommending their use.

Construction Observation

■ On Site Observations



Construction Observation

■ Striping Under Embankments



Construction Observation

■ Striping Borrow Areas



Construction Observation

■ Scarifying

❖ When to Use

❖ Depth

Scarifying Seed Bed



Scarifying Embankment Footprint

Construction Observation

■ Core Trench

- ❖ Depth
- ❖ Extent
- ❖ Use of Materials



Construction Observation

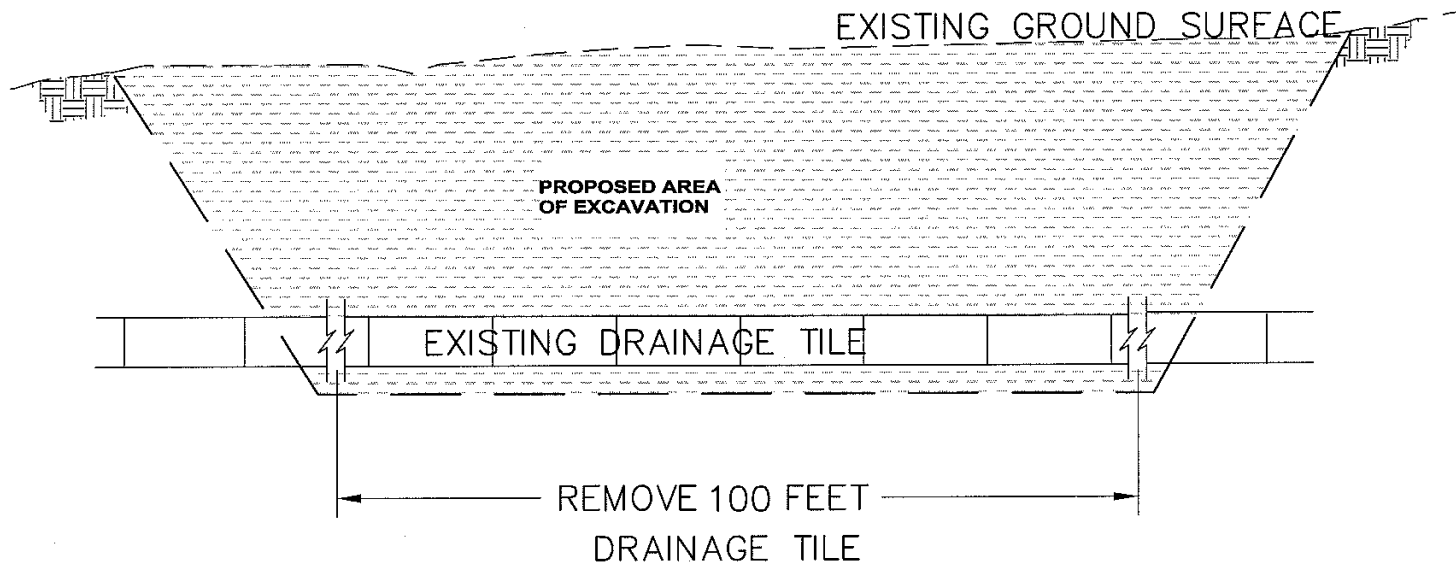
■ Tile Investigation



Construction Observation

■ Tile Removal

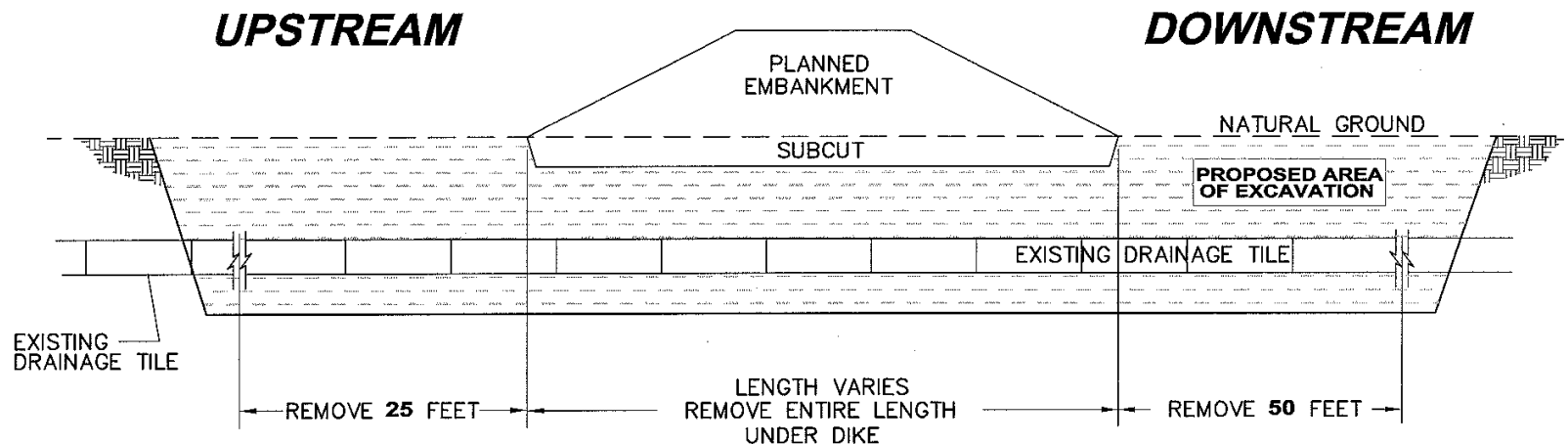
❖ Tile Block/Removal, Type “A”



Construction Observation

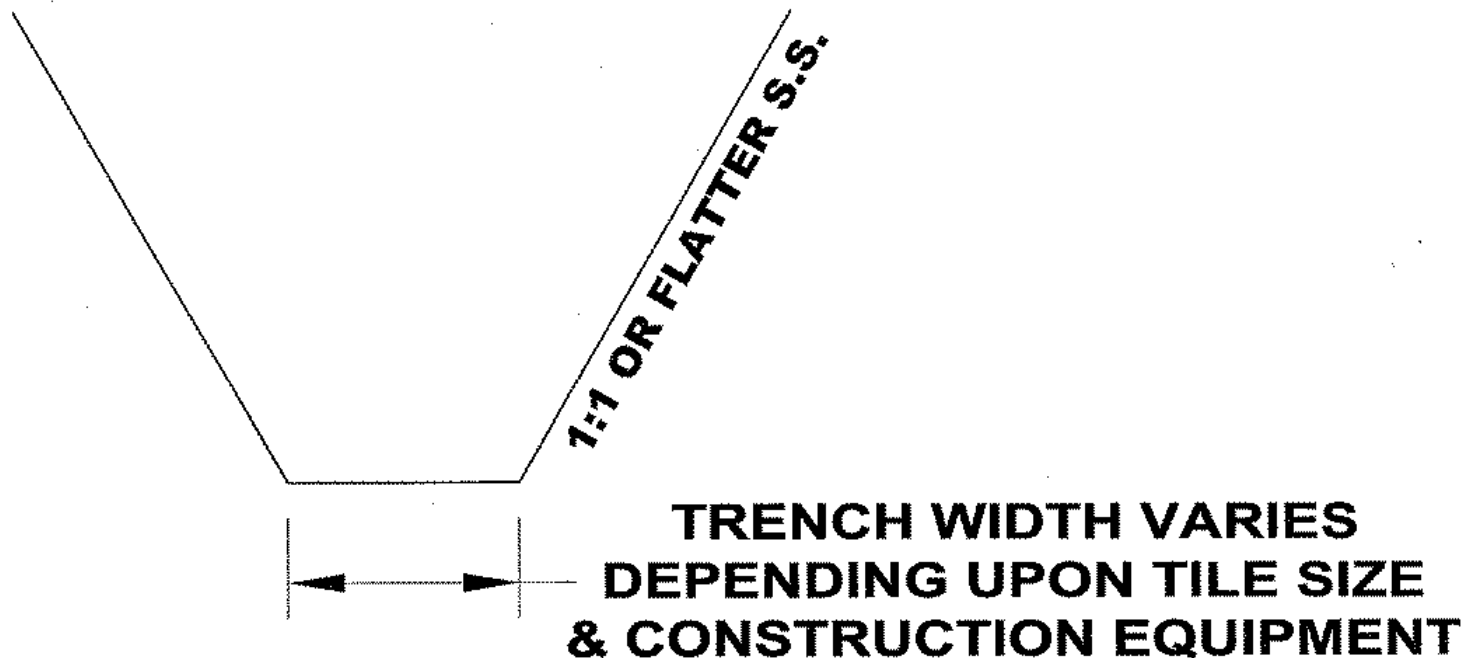
■ Tile Removal

❖ Tile Block/Removal, Type “B”



Construction Observation

■ Tile Removal



TYPICAL TILE REMOVAL TRENCH DETAIL

NOT TO SCALE

Construction Observation

■ Compaction

- ❖ Moisture Content
- ❖ Material Type
- ❖ Compaction Type
- ❖ Pipe Installation
- ❖ Sheet Pile Installation
- ❖ Overbuild/Settlement





Compaction

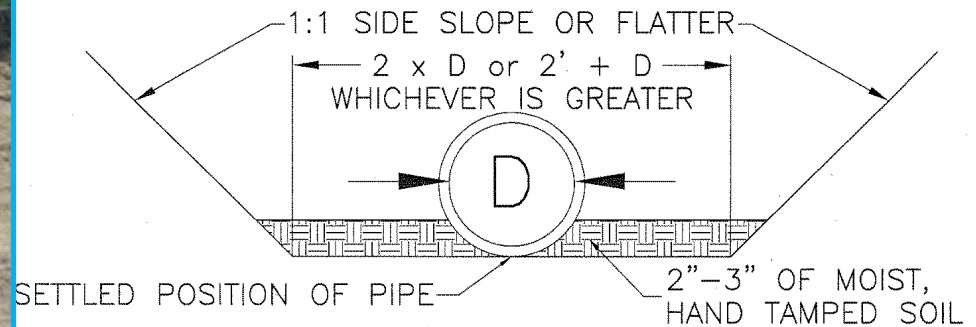
■ Compaction Equipment:

- ❖ Dozer 10-20 psi (lb/in²)
- ❖ Loaded Scraper 100 psi (lb/in²)
- ❖ Sheepsfoot 200 psi (lb/in²)



Compaction

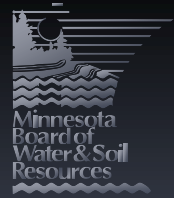
■ Pipe Installation



1. PIPE SHALL BE LOADED UNTIL HAND-TAMPED BACKFILL HOLDS IT SECURELY.
2. FILL NEXT TO THE PIPE SHALL BE PLACED IN LAYERS NOT MORE THAN 4" THICK BEFORE HAND COMPACTED.
3. HEAVY EQUIPMENT SHALL NOT BE OPERATED WITHIN 2 FEET OF THE TOP OR SIDES OF THE PIPE.

PIPE BEDDING DETAIL

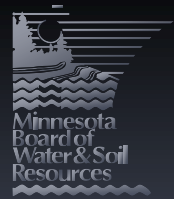
NOT TO SCALE



Compaction

■ Pipe Installation

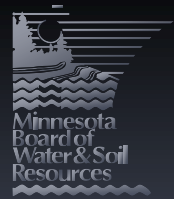




Compaction

■ Riser Installation

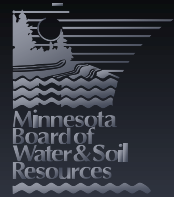




Compaction

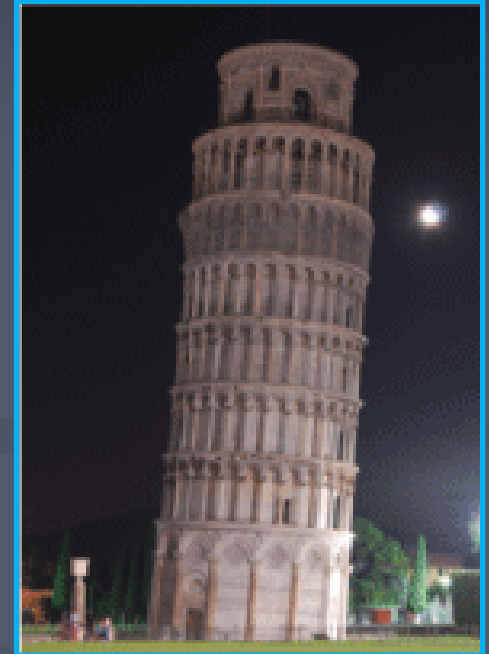
■ Sheet Pile Installation





Overbuild/Settlement

- Embankment
- Tile Blocks/Removal Areas





Documentation

- Quantities
- Processes Used
- Material Verifications
- Photos
- Daily Diary/Log





Documentation

■ What to Watch For

- ❖ Unsuitable subgrade materials
- ❖ Proper Compaction
- ❖ Quality materials (conduits, appurtenances, etc)
- ❖ Proper grade control





Documentation

■ What to Document

❖ Survey Notes

- Core Trench Limits
- Embankment Profile & Cross-Section
- Conduit Inlet & Outlet Flow Lines
- Auxiliary Spillway Profile and Cross-Section

❖ Material Certifications

❖ Technicians Notes (Job Diary)

- Daily Progress
- Pertinent Conversions and Events

Documentation

■ Suggested Format

[illegible]



Documentation

- **Inspect to Fullest Extent Possible During Actual Construction**
 - ❖ Easier to Make Corrections
 - ❖ Contractor Will Respect Plans/Specs Because You Do
 - ❖ Don't **“SUPERVISE”** the Contractor



Engineering/Technical Practices

■ Project Modifications

- ❖ What Prompted the Change/Modification
- ❖ Who Can Make Changes/Revisions
 - Engineer or Engineer's Field Technician/Representative
- ❖ Who Needs to Approve
 - Engineer or Engineer's Field Technician/Representative
- ❖ When is a Change Ordered Needed
 - New Item
 - Scope Change

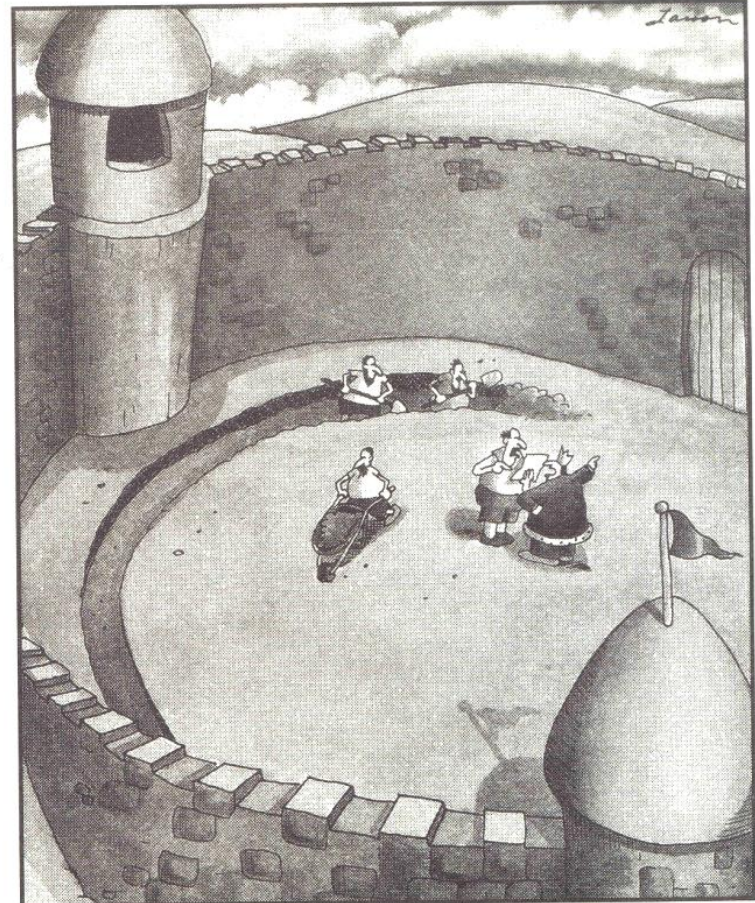




Agenda

■ Vegetation Establishment

- ❖ Key Considerations
- ❖ Specifications
- ❖ Schedules
- ❖ Seeding Near Waterbodies
- ❖ Seed Bed Preparation
- ❖ Flexibility
- ❖ Weed Control
- ❖ Establishment Results
- ❖ Monitoring



Suddenly, a heated exchange took place between the king and the moat contractor.

Vegetation Establishment





Vegetation Establishment

■ Key Considerations

- ❖ Transitioning to/from Construction
- ❖ Effective Weed Control
- ❖ Checking Establishment Results



Vegetation Establishment

■ Specifications

- ❖ Meeting Seed Law
- ❖ Pure Live Seed
- ❖ Yellow Tag Seed
- ❖ Substitutions
- ❖ Mixing Directions
- ❖ Delivery Directions



Vegetation Establishment

■ Specifications

❖ BWSR Native Vegetation Guidelines

- Developed 2009
- Meet Legislation
- Help Ensure Project Success



NATIVE VEGETATION ESTABLISHMENT AND ENHANCEMENT GUIDELINES 12/23/09

Intent: This document summarizes current guidelines for the use of native seed and plants (herbaceous and woody). Consistent with the following legislation, projects are required to use local sources of plant materials and strive for diversity levels that will provide high levels of ecological function.



(2009 Legislation) "To the extent possible, any person conducting a restoration with money appropriated in this section must plant vegetation or sow seed only of ecotypes native to Minnesota, and preferably of the local ecotype, using a high diversity of species originating from as close to the restoration site as possible, and protect existing native prairies from genetic contamination."

The following guidelines apply to BWSR programs across the state for seed and plants.

Diversity Levels: High species diversity is recommended for projects to promote native community stability and function, to provide benefits to multiple wildlife species and to prevent establishment of invasive species. Diversity levels may vary depending on the target plant community, site conditions and project goals. The following table provides baseline diversity levels for a range of project conditions and goals.

		Baseline Diversity Recommendations					
Current Site Conditions	Natural Areas with High Species Diversity	15	20	30	30	30	40
	Some Intact Ecological Characteristics	10	20	25	25	25	35
	Agricultural Field	10	15	15	20	20	25
	Disturbed Site (Urban Soils, Compaction etc.)	5	10	15	20	20	25
	Disturbed Site with High Invasive Species Risk	5	5	15	20	20	20
		Project Goals					
		Soil Stabilization	Water Quality	Grassland Bird Nesting	Habitat for Multiple Wildlife Groups	Native Plant Community Restoration (mixture with single treatment)	Native Plant Community Restoration (grasses, sedges, forbs)



Vegetation Establishment

■ Schedules

❖ Detailed Schedule

❖ Coordinate Construction

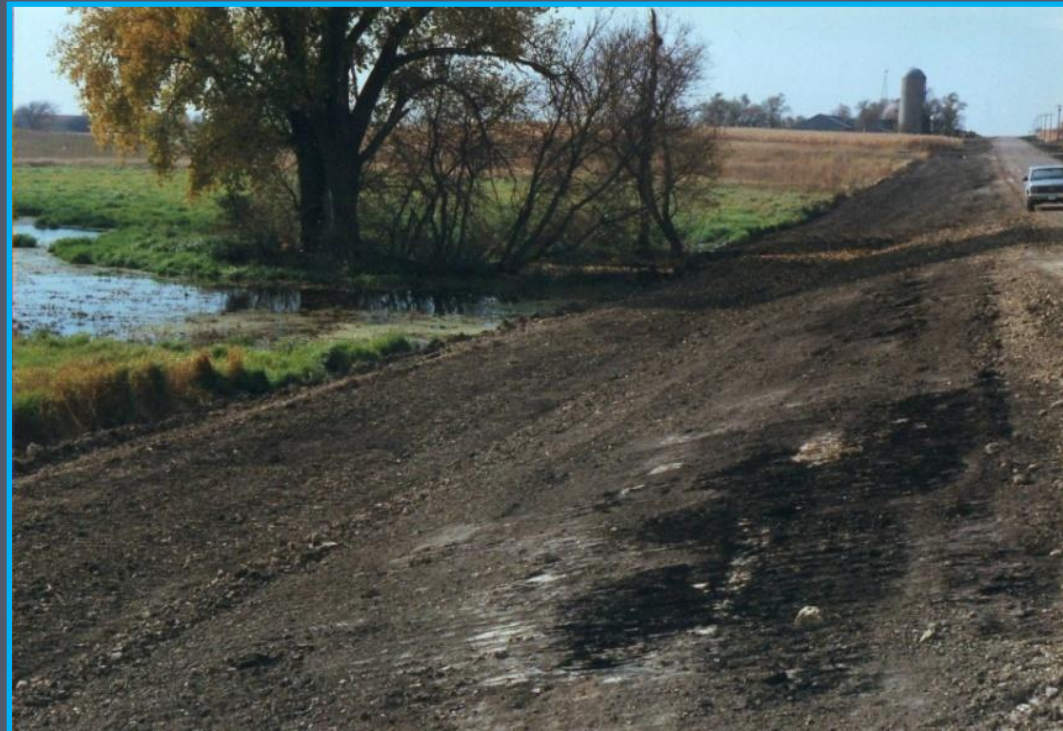
❖ Coordinate Vegetation Installation

- | | |
|-------------------------------|--|
| ➤ Early August 2012 | Initiate Construction |
| ➤ Early September 2012 | Finalize construction and seed winter wheat |
| ➤ Early October 2012 | Conduct spot treatment of weeds |
| ➤ Mid October 2012 | Conduct dormant seeding of permanent mixes |
| ➤ May 2012 | Conduct first mowing of upland areas and wetland areas that are accessible |

Vegetation Establishment

■ Schedules

- ❖ Timing – Spring vs. Fall Seeding
- ❖ Construction Mix or Cover Crop
- ❖ Seed Bed Preparation
- ❖ Flexibility





Vegetation Establishment

■ Schedules

❖ Timing

- Construction Start Date
- Weather Conditions

❖ BWSR's Guidance

- Preferred Seeding Dates
- Types of Seed




Vegetation Establishment

■ Schedules

❖ Recommended Seeding Dates

➤ http://www.bwsr.state.mn.us/native_vegetation/seeding-dates.pdf



Recommended Seeding Dates for Restoration Projects

Recommended Dates / Vegetation Type

Vegetation Type	Spring/Early Summer	Mid-Summer	Early Fall	Late Fall (Dormant Seeding)	Snow Seeding
Prairie Grasses	Apr. 15 - Jun 30	*	Aug 1 - Oct 1	Oct 15 - Frozen Soil	Feb 15 - April 7
Prairie Sedges and Forbs	Apr. 1 - Jun 30	*	Aug 1 - Oct 1	Oct 15 - Frozen Soil	Feb 15 - April 7
Wetland Grasses	Apr. 1 - Jun 30	*	Aug 1 - Oct 1	Oct 15 - Frozen Soil	Feb 15 - April 7
Wetland Sedges and Forbs	Apr. 1 - Jun 30	*	Aug 1 - Oct 1	Oct 15 - Frozen Soil	Feb 15 - April 7
Native Construction Mix	Apr. 1 - Jun 30	*	Aug 1 - Oct 1	Oct 15 - Frozen Soil	Feb 15 - April 7
Oats Cover	Apr. 1 - Jun 30	*	**	Oct 15 - Frozen Soil	Feb 15 - April 7
Winter Wheat Cover	**	*	Aug 1 - Oct 1	Oct 15 - Frozen Soil	Feb 15 - April 7

Success Rates:

High Success Rates
Medium Success Rates
Low Success Rates
* Not Recommended Without Watering
** Not Recommended

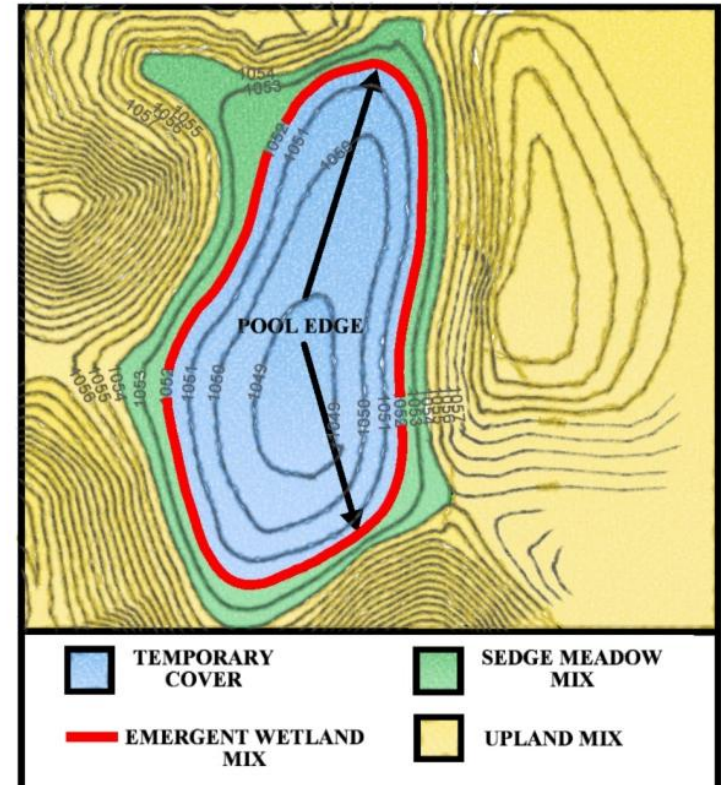
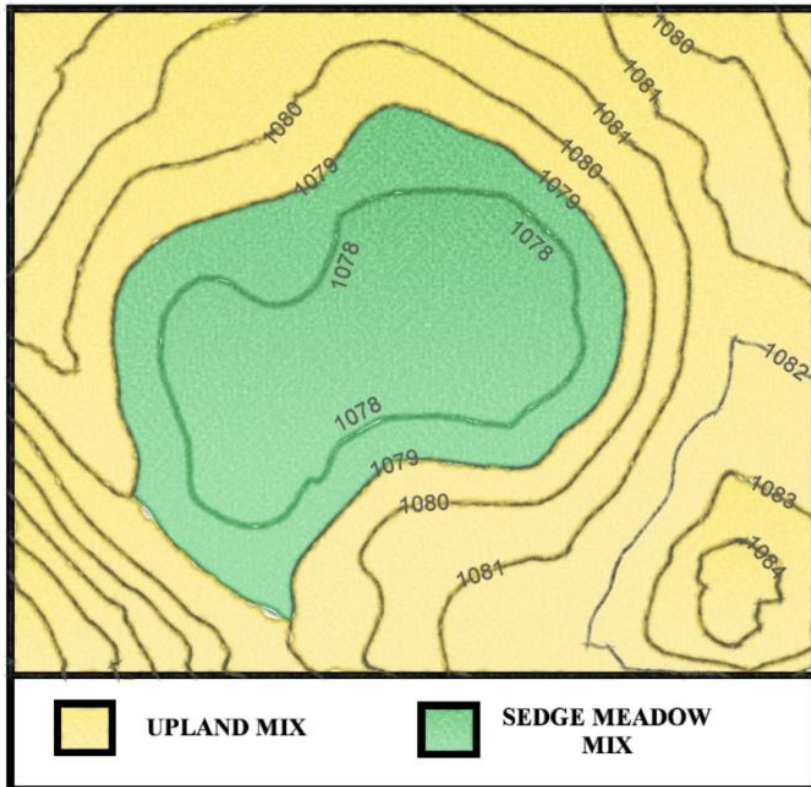
Note: Planting dates will vary from northern to southern Minnesota.

Notes about success rates: Success is less predictable for optional vegetation types and seeding dates, so use the recommended dates for each vegetation type unless construction sequencing or other factors make that impossible. For example, if the state of Minnesota "Native Construction" mix is used in early fall, watering is recommended to aid establishment.

Vegetation Establishment

■ Schedules

❖ Topography





Vegetation Establishment

■ Schedules

- ❖ Cover Crop?
- ❖ Construction Mix?

Cover crops are often used to stabilize a site in preparation of installing a permanent native seed mix.



Vegetation Establishment

■ Schedules

- ❖ Cover Crop?
- ❖ Construction Mix?



Native construction mixes are typically used in disturbed areas needing a combination of rapidly establishing cover along with longer-lasting native grasses and forbs.

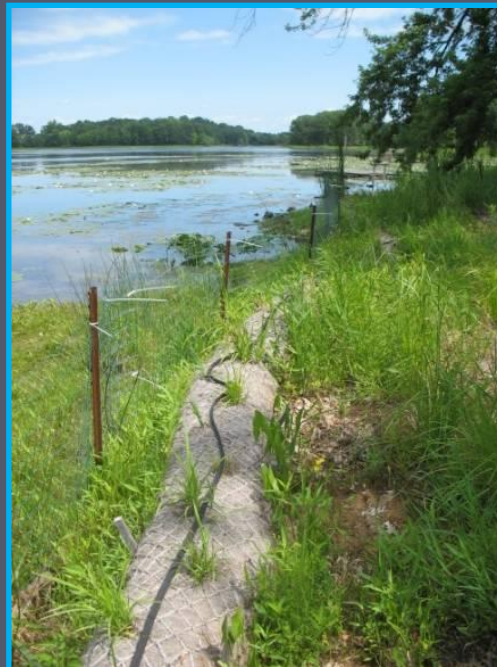


(Native Construction and Dry Swale/Pond State Mixes often used for RIM)

Vegetation Establishment

■ Seeding Near Waterbodies

- ❖ Quick Sequencing
- ❖ Quick Establishing Species
- ❖ Additional Erosion Control Measures



Vegetation Establishment

■ Seed Bed Preparation

❖ Dependant on Equipment

- Firm – Drills
- Rough - Broadcast



Vegetation Establishment

■ Flexibility

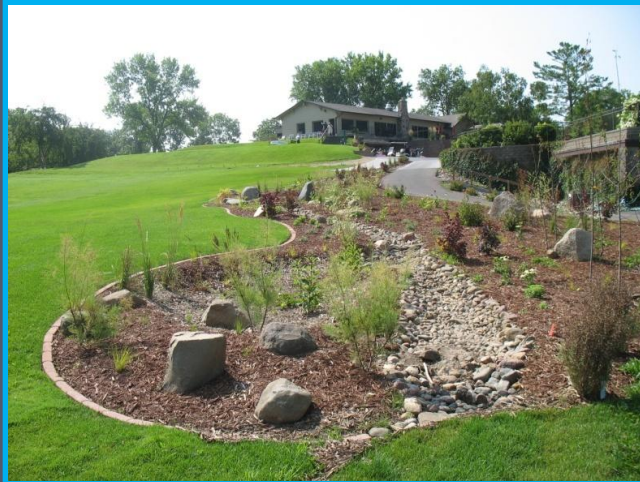
❖ Scheduling Issues



Vegetation Establishment

■ Weed Control

❖ Management During Establishment



Minnesota Wetland Restoration Guide Vegetation Section:
http://www.bwsr.state.mn.us/native_vegetation/index.html

Vegetation Establishment



■ Establishment Results

❖ Project Specifications

- Spacing of Native Species
- Diversity Level
- Invasive Species



Vegetation Establishment

■ Monitoring

- ❖ Assess Species Establishment
- ❖ Identify Maintenance Needs



Agenda

- Construction Plan Components
- Contractor Bidding and Selection
- Construction Implementation
- **Project Close-Out**



Agenda

■ Project Close-Out

- ❖ As-Built Plans
- ❖ Construction Certification
- ❖ Review Contractor Invoices and Making Payment



Project Close-Out

■ Construction Certification

- ❖ Engineer
- ❖ Technician/Appropriate Technical Approval Authority (TAA)

■ As-Built Drawings

- ❖ Document all Changes on Construction Plans

■ Reviewing of Invoices

■ Final Payment





Project Close-Out

■ Construction Certification

- ❖ Ensure that construction is done according to the approved plan

CONSTRUCTION CERTIFICATION STATEMENT

I HEREBY CERTIFY THAT A FINAL INSPECTION OF THIS PROJECT HAS BEEN PERFORMED AND THAT THE WORK COMPLETED IS IN ACCORDANCE WITH THE PLANS AND CONSTRUCTION SPECIFICATIONS AND THAT ANY CHANGES TO THE PLANS AND SPECIFICATIONS ARE SO NOTED.

SIGNATURE:

DATE:



Project Close-Out

Oversight

- Ensure that construction is done according to the approved plan

CONSTRUCTION CERTIFICATION STATEMENT

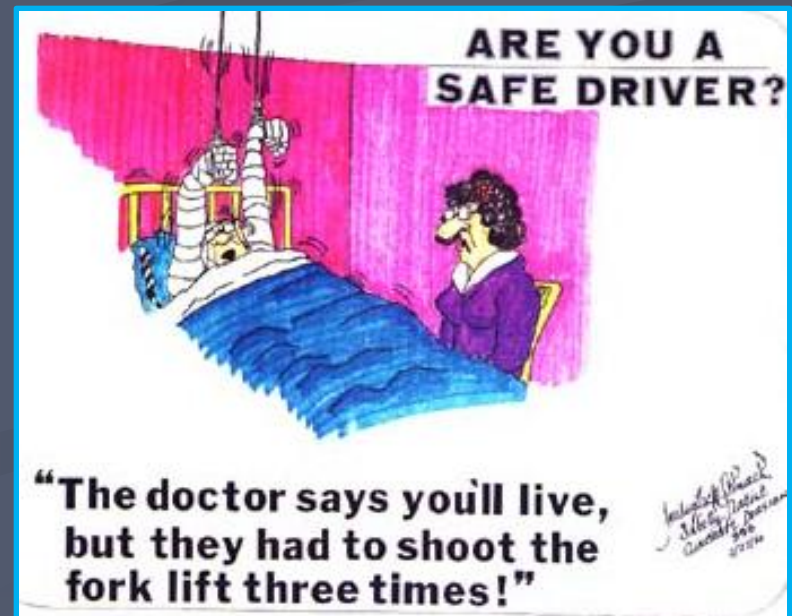
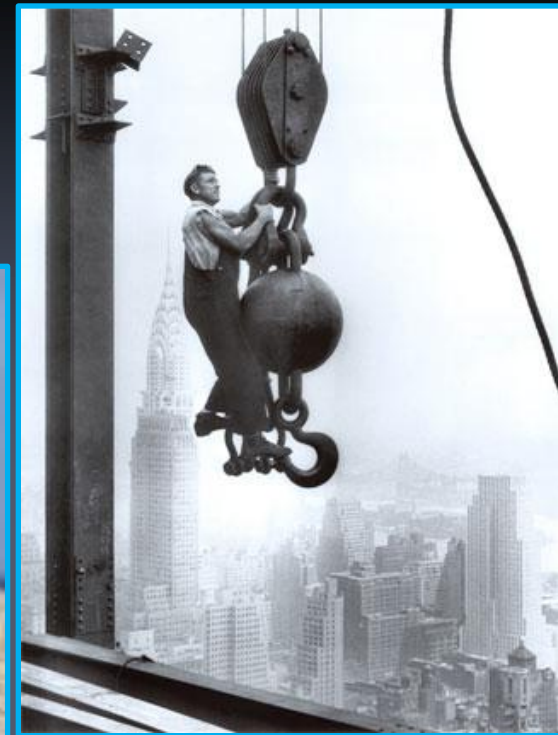
I HEREBY CERTIFY THAT A FINAL INSPECTION OF THIS PROJECT HAS BEEN PERFORMED AND THAT THE WORK COMPLETED IS IN ACCORDANCE WITH THE PLANS AND CONSTRUCTION SPECIFICATIONS AND THAT ANY CHANGES TO THE PLANS AND SPECIFICATIONS ARE SO NOTED.

SIGNATURE:

DATE:

Safety!!!

- Hard Hats
- Safety Vests
- Trench Safety



Safety!!!

Hard Hats?



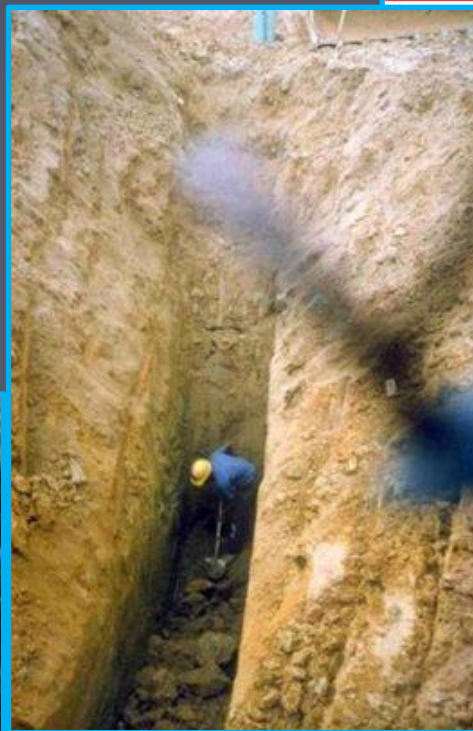
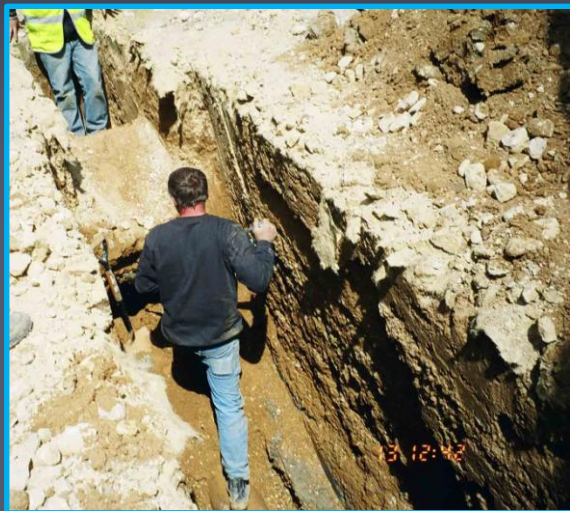
Safety!!!

■ Safety Vests

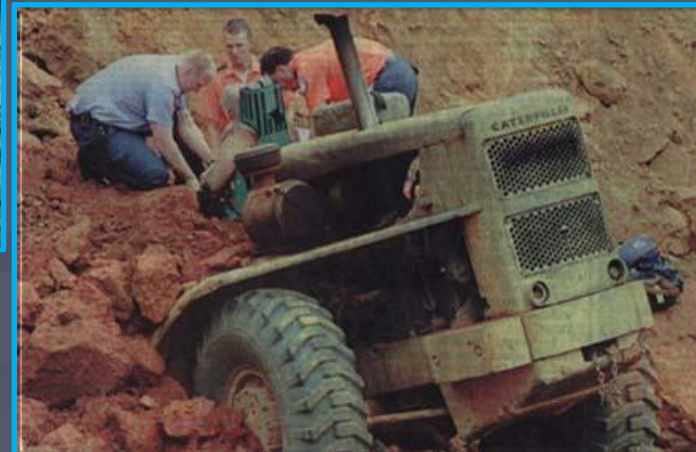


Safety!!!

■ Trench Safety



Fissure identified by Compliance Officer. Entire area around fissure collapsed into trench within minutes of initiating the inspection.



Be Prepared - It Will Rain



Be Prepared - It Will Rain



Be Prepared - It Will Rain



Questions?

